ITEM 10.V.

MOORPARK CITY COUNCIL
AGENDA REPORT

TO: **The Honorable City Council**

FROM: **Jeremy Laurentowski, Parks and Recreation Director** JL

DATE: **September 8, 2014 (CC Meeting of September 17, 2014)**

SUBJECT: **Consider Resolution Amending the Fiscal Year 2014/15 Budget for Civil Engineering and Geotechnical Services at Arroyo Vista Community Park**

DISCUSSION

On December 18, 2013, the City Council approved funding in the amount of $15,800 in order to obtain a geotechnical evaluation for a retaining wall at Arroyo Vista Community Park (AVCP) that is in need of replacement. The retaining wall is located at the top of slope on the south side of the park, adjacent to three homes at the end of the cul-de-sac on Honeyglen Court and Summerglen Court. The actual construction date of the retaining wall is unknown, but staff suspects that it was constructed around the same time that the homes were constructed in 1985. Over time, several wood beams have dislodged from the wall and there appears to be a significant amount of outward deformation.

In February, 2014, staff contracted with Fugro Consultants, Inc. (Fugro) to prepare a geotechnical report pertaining to the existing soil and slope conditions. The geotechnical investigation consisted of four borings to a depth of approximately twenty feet and concluded that the movement of the existing wall is due to a combination of factors, which include the initial design and degradation of the existing wall, as well as the creep-type soil movement of the fill soils above the wall. In an effort to address these factors, the geotechnical engineer recommended the installation of a soldier pile-type retaining wall to replace the existing wall. The installation of the soldier pile wall that was recommended would require the installation of steel tiebacks designed to resist lateral and rotational movement. However, the tiebacks would also require permanent easements over private property, as the tiebacks would need to be installed a significant distance from the actual wall, within the property of the adjacent single family lots.

Due to staff's concerns regarding the permanent easements required for this work, staff obtained the assistance of a civil engineer, Phoenix Civil Engineering, Inc. (Phoenix), to prepare a series of options for the replacement of the wall that would not require permanent easements over the adjacent single family lots. The wall study prepared by Phoenix (see Attachment No. 2) includes four wall options; a post and beam type wall similar to the one currently installed, but with heavier gauge posts; a traditional concrete retaining wall with a modified concrete footing; a soldier beam wall with deepend footings; and the soldier beam wall option with tiebacks recommended by the geotechnical engineer. All four options will require temporary encroachment on private property during construction and the replacement of the existing property line fence.

Due to the steep slope conditions that appear to be the result of a small landslide that most likely occurred prior to the construction of the existing wall, as well as the existing soil conditions, both the civil engineer and geotechnical engineer agree that a soldier beam wall is necessary to prevent future lateral and rotational movement of the new wall. However, due to the property boundary constraints, staff believes that option 3, a cantilevered soldier beam wall with deepend footings, is the preferred option to replace the existing retaining wall. This wall will provide a permanent replacement for the existing retaining wall and will provide the necessary resistance to lateral and rotation movement. The City Engineer/Public Works Director concurs with this recommendation.

Phoenix has provided staff with a rough estimate for this work and believes that it will cost approximately $50,000 to $60,000 to replace the existing retaining wall with wall option no. 3. This does not include temporary grading during construction, restoration of the slope landscaping and irrigation, or the replacement of the wrought iron fence adjacent to the property lines of the existing single family homes. Staff will prepare a construction estimate upon receipt of the civil engineering plans and specifications.

FISCAL IMPACT

As discussed during the December 18, 2013 City Council meeting, staff recommends contracting with a civil engineer to prepare the plans and specifications for the construction of a new retaining wall at Arroyo Vista Community Park. In addition, due to several site constraints, primarily the close proximity of adjoining property lines, an amendment to the agreement with Fugro will be necessary in order to design the retaining wall concept proposed by the civil engineer. Cost for this work is approximately $26,610, which includes $19,191 for the civil engineering work, $5,000 for the revisions to the geotechnical recommendations and additional field coordination, and a 10% contingency in the amount of $2,419.

Funding was not included in the Fiscal Year 2014/15 spending plan. Staff is requesting an additional appropriation from the General Fund (1000) in the amount $26,610 to the Parks Division (7800) to complete this work.

STAFF RECOMMENDATION (ROLL CALL VOTE)

1. Adopt Resolution No. 2014 - _____ amending the FY 2014/15 budget to appropriate $26,610 from the General Fund (1000) to fund this work.

Attachments:

1. Resolution No. 2014-_____
2. Retaining Wall Options
3. Fugro Geotechnical Report
4. Proposal - Phoenix Civil Engineering, Inc.
5. Proposal – Fugro Consultants, Inc.

RESOLUTION NO. 2014 -____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MOORPARK, CALIFORNIA, AMENDING THE FISCAL YEAR 2013/14 BUDGET TO ALLOCATE $26,610 FROM THE GENERAL FUND (1000) TO THE PARKS DIVISION (7800), FOR GEOTECHNICAL AND CIVIL ENGINEERING SERVICES AT ARROYO VISTA COMMUNITY PARK

WHEREAS, on December 18, 2013 City Council adopted Resolution No. 2013-3256, which allocated $15,800 from the General Fund (1000) to obtain a geotechnical evaluation of a retaining wall at Arroyo Vista Community Park (AVCP); and

WHEREAS, on June 18, 2014, the City Council adopted the Operating and Capital Improvement Budget for Fiscal Year 2014/15; and

WHEREAS, a staff report has been presented to City Council discussing the need to prepare civil engineering plans and specifications, as well as revisions to the geotechnical report, for an existing slope and retaining wall at Arroyo Vista Community Park; and

WHEREAS, an additional appropriation of $26,610 is requested from the General Fund (1000) to the Parks Division (7800) to fund this work; and

WHEREAS, Exhibit "A" hereof describes said budget amendment and its resultant impact to the budget line item.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF MOORPARK DOES HEREBY RESOLVE AS FOLLOWS:

SECTION 1. A budget amendment allocating $26,610 from the General Fund (1000) for civil engineering and geotechnical services at Arroyo Vista Community Park, as more particularly described in Exhibit "A" attached hereto is hereby approved.

SECTION 2. The City Clerk shall certify to the adoption of this resolution and shall cause a certified resolution to be filed in the book of original resolutions.

ATTACHMENT 1

RESOLUTION NO. 2014 -____

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PASSED AND ADOPTED this 17th day of September, 2014.

_____
Janice S. Parvin, Mayor

ATTEST:

_____
Maureen Benson, City Clerk

Attachment: Exhibit A – Budget Amendment

EXHIBIT A

BUDGET AMENDMENT FOR THE GENERAL FUND FOR CIVIL ENGINEERING AND GEOTECHNICAL SERVICES FOR THE RETAINING WALL AT ARROYO VISTA COMMUNITY PARK

FY 2014/15

FUND ALLOCATION FROM:

FUND TITLE	FUND ACCOUNT NUMBER	AMOUNT
General Fund	1000-5500	$26,610.00
Total		$26,610.00

DISTRIBUTION OF APPROPRIATION TO EXPENSE ACCOUNTS:

1000-7800-7803-9103	$4,909.36	$5,500.00	$10,409.36
1000-78007803-9601	$0.00	$21,110.00	$21,110.00
Total	$4,909.36	$26,610.00	$31,519.36

Finance approval: _____

Attachment 2

City of Moorpark

Arroyo Vista Park Retaining Wall

Matrix of Viable Wall Replacement Options

Replacement Type	Benefits	Issues	Range of Cost *
#1 Post and Beam (similar to existing, but with deeper installed/heavier gauge posts)	• Installation cost is the lowest. • City crews could possibly perform the installation. • Can be installed very close to existing wrought iron fence (little to no permanent encroachment onto private property).	• Non engineered solution. • Will not resist substantial lateral/rotational loading as other options. • Concrete grade beam needed for attachment of wrought iron fence. • Temporary right of entry agreement required to construct improvements	$15 to $20/sf ($15,000 to $20,000)
#2 Concrete Retaining Wall (Cast in Place or Concrete Masonry Unit)	• More robust solution than Post and Beam option. • Engineered solution.	• Footing construction will require a temporary right of entry from the adjacent property owners depending on how close the wall will be to the existing property line and the size and embedment depth of the footing. • Drainage behind wall will require piping to daylight. • Distance from wall to property line will be required for footing to prevent permanent easement. • More susceptible to downslope erosion or downslope soil movement • Temporary right of entry agreement required to construct improvements	$30 to $40/sf ($30,000 to $40,000)
#3 Cantilevered Soldier Beam Wall	• Provide steel H-pile soldier beams installed in drilled holes and encased in concrete to resist lateral/rotational movement • Provide concrete lagging between soldier beams to retain the soil	• Steel columns need to be sized to make up for lack of tiebacks • No tiebacks as additional reinforcement against movement long term. • Temporary right of entry agreement	$50 to $60/sf ($50,000 to $60,000)

	• Final wall location could be close to the existing property line without a permanent easement from adjacent parcel owners. • Elimination of path at top of slope. • Better resistance to erosion and shallow downslope soil movement • Engineered solution. • Less grading required than Options 1 and 2.	required to construct improvements.	
#4 Tieback Soldier Beam Wall	• Substantial design with tiebacks will significantly reduce movement/rotation of wall. • Elimination of path at top of slope. • Less susceptible to erosion and shallow soil movement than other solutions • Engineered solution. • Less grading required than Options 1 and 2.	• Extensive permanent easements required from adjacent parcel owners for tiebacks. • Costliest of all options considered. • Temporary right of entry agreement required to construct improvements	($75 to $100/sf) ($75,000 to $100,000)

*** Assume 4 foot average height and 250 foot long wall.**

FUGRO CONSULTANTS, INC.

4820 McGrath Street, Suite 100
Ventura, California 93003-7778
Tel: (805) 650-7000
Fax: (805) 650-7010

April 9, 2014
Project No. 04.62140011

City of Moorpark
Public Works Department
799 Moorpark Avenue
Moorpark, California 93021

Attention: Mr. Jeremy Laurentowski

Subject: Geotechnical Engineering Letter-Report, Proposed Replacement Retaining Wall Arroyo Vista Park, Moorpark, California

Dear Mr. Laurentowski:

Introduction and Background

Fugro is pleased to present this letter-report that summarizes the work we performed on this project, describes our findings, and provides recommendations for replacing an existing distressed retaining wall at Arroyo Vista Park. The existing retaining wall is located near the crest of a 25- to 30-foot high slope located south of the park's tennis courts and along southern the boundary adjacent to an existing residential tract (developed as Tract 3864). The slope is heavily vegetated and descends from the retaining wall at an inclination of about 1-1/2h:1v to 2h:1v.

The existing wall consists of a steel post and wood beam retaining wall. The wall appears to retain up to about 5 feet of soil and is about 90 feet in length. The ground at the top of the wall is basically level and a decorative iron fence constructed for the housing tract is located about 3 to 4 feet south of the wall.

The existing retaining wall and decorative fence are locally displaced to the north. Both the fence and wall exhibit visible outward deformation or bowing localized near the property line between lots 131 and 151 as shown on the Ventura County as-built grading plans for Tract 3864. From our discussions, we understand that the City has no records of when or why the retaining wall was constructed. However, based on observations in the field, it is possible that the wall was constructed along the headscarp of a possible shallow landslide in an effort to prevent ground movement upslope of the wall. Information in Mendall, Aragon, Worswick & Associates [MAWA] (1982[1], 1983[2]) suggests that a shallow failure of the descending slope in

[1] Mendall, Aragon, Worswick, & Associates (1982), "Geotechnical Investigation for Tract 3864, Moorpark, Ventura County, California," Project No. L1378A, unpublished report prepared for Urban West Communities, dated September 9.

[2] Mendall, Aragon, Worswick, & Associates (1983), "Compaction Report, Lots 12, 13, and 29 of Tract 3864, Mountain Meadows, Moorpark, County of Ventura, California," Project No. L1378E, unpublished report prepared for Urban West Communities, dated June 29.

the project area may have occurred in 1983 (likely as a result of heavy rain that occurred in the winter of 1983). We note that MAWA (1983) references a June 21, 1983, letter titled "Proposed Slope Repair and Fill Slope Alteration", however we were not provided a copy of that letter.

Work Performed

Our work performed on the project consisted of the following tasks:

Project Initiation and Data Review. We worked with the staff from the City of Moorpark and the County of Ventura to gather available, existing geotechnical data for the project area. After some research, the City of Moorpark was able to locate and provide us with grading plans and geotechnical data associated with the development of Tract 3864. We reviewed that data and published geologic maps of the project area as part of the work performed for this task.

Subsurface Exploration. We excavated four soil borings at the site to depths of up to 20 feet using hand drilling and sampling methods. The drill holes were located above the wall and at the base of the wall. We subcontracted the hand digging and sampling work to Mike's Excavating Service of Temecula, California. Soil samples were collected using a modified California (Mod Cal) liner sampler and the sampler was driven 6 inches into the subsurface materials at the bottom of the drill hole using a light weight slide hammer operated by hand. A Fugro staff engineer observed the drilling activities, logged the soil conditions encountered in the drill holes and packaged recovered soil samples for transport to our laboratory. Prior to the drilling work we staked the drill hole locations in the field and contacted Underground Service Alert (USA) to request marking of existing underground utility lined in the proposed work areas.

Laboratory Testing. We performed geotechnical laboratory tests on selected samples obtained from the field exploration program and used those results to assist our characterization of the geotechnical engineering properties of the on-site soil materials. Tests were conducted to assess total unit weight and moisture content (and dry unit weight), Atterberg Limits (Plasticity), and shear strength (consisting of direct shear and unconsolidated undrained compression)

Geotechnical Evaluation and Report. We reviewed the geotechnical data acquired for the project, developed an idealized geotechnical profile representative of the conditions, developed opinions regarding slope stability, and provided design parameters and geotechnical recommendations for the design of the proposed retaining wall.

Findings

Geotechnical Conditions. Soil materials in the project area appear to consist of artificial fill overlying older alluvium. Based on data from the drill holes, the artificial fill is approximately four to about 7 feet thick and consists of medium stiff to stiff silt and lean to sandy lean clay. The older alluvial soils encountered below the fill generally consisted of stratified layers of very stiff sandy lean clay, clayey sand, and sand. Generally the artificial fill soils and older alluvial materials were dry to slightly moist at the time of sampling.

MAWA (1982) maps landslide debris or shallow instability/creep prone soils extending several hundreds of feet along the toe of the descending slope in the project area.

Measured in-place dry unit weight of samples of artificial fill generally ranged from about 88 to 104 pcf, but a dry unit weight of 51 pcf was measured on one of the four samples tested. In-situ moisture contents ranged from 6 to 10 percent. Measured dry unit weights on samples of older alluvium ranged from 89 to 103 pcf with an average value of 95 pcf for the eight sampled tested. MAWA (1983) reports that laboratory maximum densities (from ASTM D1557) of 117 and 121 pcf were used for evaluating earthwork and soil compaction for the development of the tract (Lots 12, 13, and 29) in the grading control pcf and The results of direct shear tests performed on samples of older alluvium resulted in measured friction angles of 32 to 34 degrees and cohesion values of 100 to 500 psf. MAWA (1982) reported friction angles of 24 to 30 degrees and cohesion values of 0 and 420 psf for two samples tested in that study. An undrained shear strength of 4,800 psf was measured on one sample of older alluvium.

It should be noted that the process of hand sampling used to obtain the samples tested in this study can sometimes result in more disturbance to the sample than commonly results when using mechanical drilling and sampling methods. As a result, the unit weight and strength values determined from those samples may underestimate the parameters under in-situ conditions.

Groundwater Conditions. Groundwater was not encountered in the 20-foot-deep drill holes excavated for this project. In addition, MAWA (1982) reportedly did not encounter groundwater in two, 20-foot-deep soil borings drilled in the study area for the development of Tract 3864. Although groundwater was not encountered in our study, we note there is a potential for very moist to wet soil conditions and possibly perched groundwater to occur in the subsurface following periods of heavy precipitation.

Generalized Geotechnical Cross Section. We developed an idealized geotechnical cross section for use in our analyses and to develop recommendations for the project. Topographic and subsurface conditions assumed for the project are shown on Plate 3 – Geotechnical Cross Section. We assumed the following soil parameters for our geotechnical evaluations.

Table 1. Assumed Soil Parameters

Soil Type	Total Unit Weight	Friction Angle (degrees)	Cohesion (psf)
Artificial Fill	115 pcf	32	100
Older Alluvium	120 pcf	33	200

Seismic Considerations. No active or potentially active faults have been mapped at or trending towards the project site. The closest mapped fault is the Simi-Santa Rosa fault located over a mile south of the project site. Although no faults are present in the immediate project

area, the site will be subjected to strong ground shaking from earthquakes on local or regional faults.

To evaluate the potential for strong ground shaking, we performed a probabilistic seismic hazard analysis for the site location using the USGS 2008 Interactive Deaggregations (Beta) web application (USGS, 2008). California Geological Survey (CGS, 2008), Special Publication 117A defers to the USGS website to determine a uniform hazard spectrum for a specified location in terms of latitude and longitude. On the basis of our analyses using the USGS (2008) website application, the peak horizontal ground acceleration (pga) at the project area is estimated to be about 0.55g for an earthquake event with a 475-year return period (10 percent probability of exceedance in 50 years) assuming Site Class D soil conditions. Table 1 summarizes the probabilistically estimated strong ground motion parameters for the project site. We used the information provided in Table 2 to estimate the lateral force increase on the wall considering seismic/dynamic conditions.

Table 2. Summary of USGS Probabilistic Seismic Hazard Deaggregation Results

Return Period (years)	Mean Magnitude (Mw)	Mean Source Distance (km)	Peak Horizontal Ground Acceleration
475	6.9	11.6	0.55g

Recommendations

General. We understand that the City of Moorpark would like to remove the existing distressed retaining wall and replace it with a new retaining structure. In our opinion, it is feasible to construct a new retaining wall to replace the existing wall. However, site access is fairly limited and there are a few larger trees in the project area that may need to be removed. The lateral extend of the wall is somewhat uncertain. However, we expect the City of Moorpark will want to plan the length of the wall to extend beyond where distress to the existing wall and iron fencing is visible.

In general, we concur with the opinions presented in MAWA (1982) that the existing descending slope can be considered stable under static conditions for deep-seated-type failure surfaces. However, the inclination of the slope is relatively steep and based on past performance and the results of shear strength tests, in our opinion the soils present in the slope area may be susceptible to erosion and shallow/surficial instability. Qualitatively, movement of the existing retaining structure is likely the result of a few factors, consisting of: 1) inadequate initial design, 2) degradation of the wall over time, and 3) creep-type soil movement of the fill soils above the wall.

In an effort to address those factors in the design of the replacement wall, we believe that a more robust soldier pile-type retaining wall is probably the most feasible wall type for the proposed replacement wall. Because the retained height of the soil is relatively limited (less than about 5 feet), it is likely that a cantilevered wall can be used. Therefore, recommendations provided in our report focus on providing geotechnical and lateral earth pressures for use in designing a cantilevered soldier pile and lagging-type retaining wall.

Site Grading. We recommend that the existing retaining wall and iron fencing be demolished. Access to private property will likely be required for demolition and construction staging. Following demolition of the existing facilities, we recommend that existing vegetation be removed and existing artificial fill soils be excavated to expose firm older alluvial soils at and upslope of the wall. However, because of the site constraints, it may not be possible to completely remove the existing fill at or directly behind the retaining wall. In any event, we recommend that Fugro review the conditions exposed during demolition and remedial site grading. We note that additional soil removal may be needed depending on the conditions observed during grading. In our opinion, it will be preferable to export the existing soils from the site and import fill for use as backfill behind the new wall. If that is not practical, excavated soils can be stockpiled and reused as backfill material.

We recommend that fill placed as compacted backfill behind the wall consist of on-site soils or imported materials. If imported soils are used for the project, we recommend those soils consist of clean, non-plastic granular soils with less than 40 percent passing the 200 sieve and have a sand equivalent of at least 25. Soils placed as backfill should be placed in horizontal lifts not exceeding 8 inches in thickness prior to compaction, moisture conditioned to within 2 percent of optimum, and compacted to a minimum of 90 percent relative compaction referenced to ASTM D1557.

Static Lateral Earth Pressures. Our recommended lateral earth pressure distribution for a cantilevered soldier pile and lagging wall considering descending ground conditions below the wall, a retained soil height of about 5 feet, and gently sloping (ascending) ground conditions above the wall are summarized in the following table. Because of the potential for erosion and shallow instability below the wall, we recommend that a 3-foot-deep zone of soil at the wall line be neglected when evaluating passive resistance.

Table 3. Recommended Lateral Earth Pressures for Cantilevered Soldier Pile Wall

Active Pressure (Ascending Slope Conditions, assume 3h:1v)	Passive Pressure (Descending Slope Conditions, assume 2h:1v)
45 pcf	160 pcf

We have assumed that the walls will be constructed using conventional top-down construction, with the treated wood or pre-cast concrete lagging placed behind the soldier piles. We anticipate the existing wall will be removed and that new compacted soil backfill will be placed behind the lagging. The soldier pile wall should be designed for a factor of safety of at least 1.5 against sliding and overturning. We anticipate that the piles will be embedded at least 15 feet below the ground in front of the wall. Tiebacks can be incorporated into the design, if additional lateral resistance is needed.

Dynamic Pressures. Based on the 2013 California Building Code, retaining walls need to be designed to resist dynamic earth pressures. Generally, retaining walls that are relatively free to deform or rotate in response to seismic loads can be designed using the Mononobe Okabe approach with a value of k_h typically assumed as some percentage of the design

horizontal ground acceleration. Using the Mononobe Okabe method and assuming a horizontal seismic coefficient k_h of 0.28g (about 50% of the peak horizontal ground acceleration of 0.55g), the additional force on the wall from earthquake loading is estimated to be about $13H^2$ (pounds per lateral foot of wall) where H is the wall height in feet. The distribution of seismic pressure can be assumed to be uniform or rectangular and the resultant can be assumed to act at the mid-height of the wall. The dynamic lateral force increment should be considered as an additional load above the resultant static earth pressure.

Soldier Piles and Passive Resistance. The design of the wall should include a check that there is sufficient passive pressure on the embedded portion of the pile to resist kick-out. A factor of safety of at least 1.5 should be applied to the passive pressure to estimate the factor of safety against kick-out. As discussed previously, the upper 3 feet of soil at and downslope of the wall line should be considered susceptible to shallow slumping and the passive resistance should be neglected above that depth range (additional height of lagging should be provided that extends below the cut line).

To account for soil arching effects between widely spaced soldier beam elements, the passive resistance can be assumed to act over an area wider than one pile diameter (Broms, 1965)[3]. For this project, the passive resistance of the soldier beam embedded below the excavation limit can be assumed to act over a width equal to two times the pile diameter.

A phreatic groundwater surface is not anticipated to develop in the slope. Therefore, passive resistance of the soldier beams below the excavation limit provided in Table 2 was derived using the total soil unit weight.

Wall Drainage. Walls designed for drained loading conditions (i.e. no hydrostatic water pressure) should be designed with collector pipes to assist in the removal of water from the backfill, and to prevent the buildup of hydrostatic pressures behind the wall. A continuous layer of granular drainage material consisting of either 1 foot of free draining soils or geocomposite drain panels should be provided along the backside of wall. The drainage material should be terminated 2 feet below the finished grade of the wall backfill, and be topped with on-site fine-grained soil or topsoil. An outlet pipe should be provided to convey water collected behind the wall and designed to outlet in a controlled, non-erosive manner.

Construction Considerations. The subsurface conditions encountered at the site generally consist of artificial fill materials overlying older alluvial deposits. The artificial fill materials were generally encountered within 4 to 7 feet of the existing ground surface. The older alluvial deposits consist of very stiff lean clay, clayey sand and sand.

We anticipate those materials can be excavated using excavation equipment and mechanical auger drilling equipment suitable for limited access conditions. Although the soils will likely be relatively stable in a drilled hole, we recommend that the potential for local caving and instability of the drilled hole be considered when selecting the excavation and drilling

[3] Broms, B.B. (1965), "Design of Laterally Loaded Piles", Journal of Soil Mechanics and Foundations Division, ASCE, Vol. 91, No. SM3, Proceedings Paper 4342, pp. 79-99.

methods for the project. In addition, because the site was not accessible to mechanical geotechnical exploration equipment and the site was explored using hand augering methods, the depth of exploration for this study was limited to 20 feet below the existing ground surface. We expect that the solider piles will need to be constructed to a depth in excess of the depth explored for this study.

Limitations

This report has been prepared for the exclusive use of the City of Moorpark and their agents for the specific application to the design of the proposed Arroyo Vista Park Replacement Retaining Wall project in Moorpark, California. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted geotechnical engineering practice of the project region. No other warranty, express or implied, is made.

Although information contained in this report may be of some use for other purposes, it may not contain sufficient information for other parties or uses. If any changes are made to the project as described in this report, the conclusions and recommendations in this report should not be considered valid unless the changes are reviewed and the conclusions and recommendations in this report are modified or validated in writing by Fugro.

Potential Variation of Subsurface Conditions. Earth materials can vary in type, strength, and other geotechnical properties between points of observations and exploration. Additionally, groundwater and soil moisture conditions also can vary seasonally or for other reasons. Moreover, we do not and cannot have a complete knowledge of the subsurface conditions underlying the site. The conclusions and recommendations presented in this report are based on the findings at the points of exploration, interpolation and extrapolation of information between and beyond the points of observation, and are subject to confirmation (to the extent possible) based on the conditions revealed during construction.

Hazardous Materials. The scope of our services presented in this report did not include any environmental site assessment for the presence or absence of hazardous/toxic/biological materials in the soil, groundwater, surface water, or the presence of wetlands or the presence of environmentally sensitive areas, endangered or candidate wildlife or vegetation, or culturally significant zones within the project area. Any statements or absence of statements in this report or data presented herein regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessment.

Closure

We appreciate the opportunity to work with the City of Moorpark on the Arroyo Vista Park Replacement Retaining Wall project and to continue our professional relationship with the City of Moorpark. If you have any questions or comments regarding the contents of this report, please contact the undersigned.

Sincerely,

FUGRO CONSULTANTS, INC.

Gregory S. Denlinger, GE
Principal Engineer

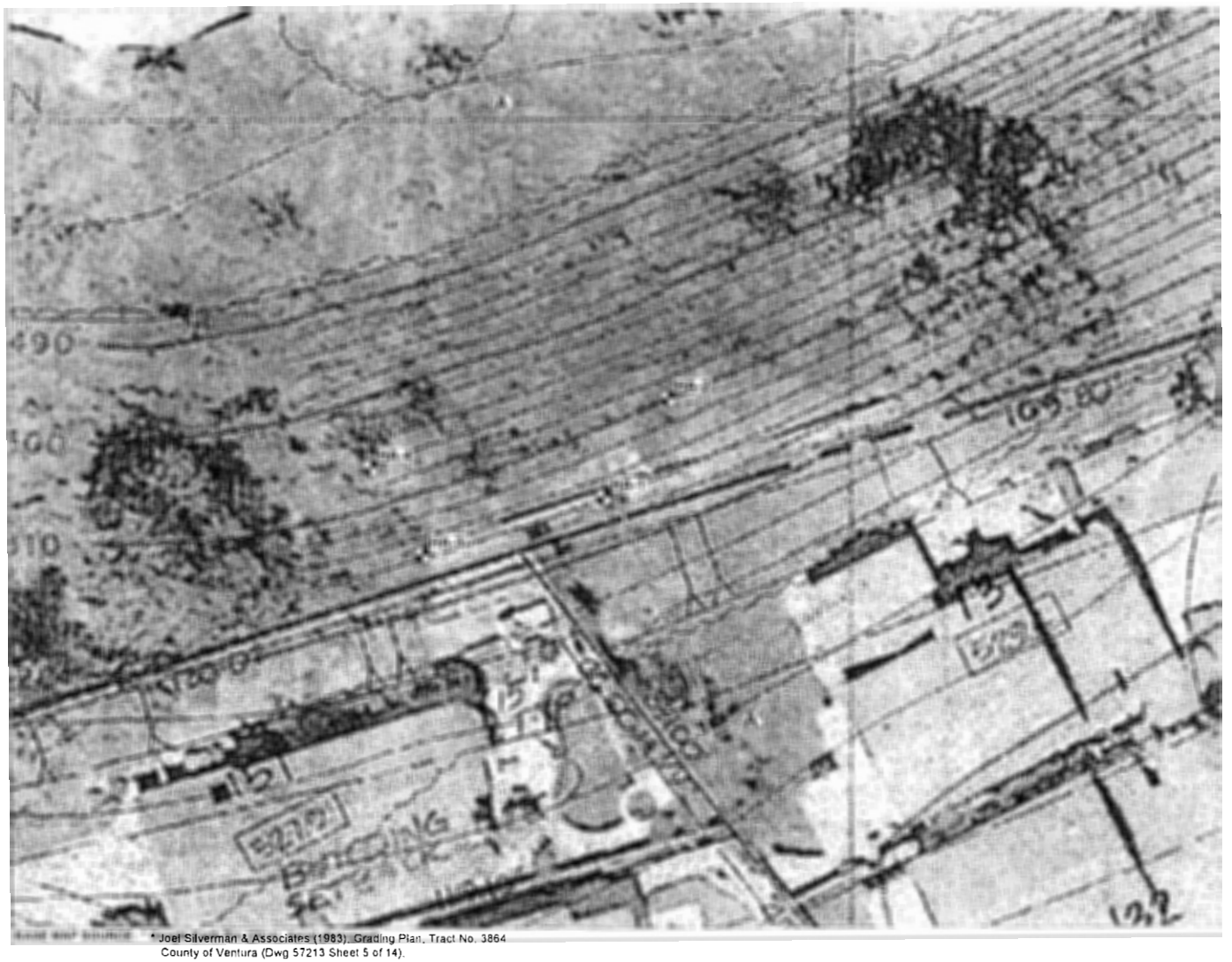
Justin Martos
Senior Staff Engineer

Attachments: Plate 1 – Vicinity Map
Plate 2 – Subsurface Exploration Plan
Geologic Cross Section A-A'
Appendix A – Subsurface Exploration
Appendix B – Laboratory Testing

Copies: (Pdf) Addressee

City of Moorpark
Project No. 04.62140011

FUGRO



* Joel Silverman & Associates (1983). Grading Plan, Tract No. 3864
County of Ventura (Dwg 57213 Sheet 5 of 14).

LEGEND

HA-4 Approximate location of Hand-Auger Boring

A A' Cross Section location

NORTH

0 20 40
FEET

SUBSURFACE EXPLORATION PLAN
Arroyo Vista Park
Replacement Retaining Wall Project
Moorpark, California

PLATE 2

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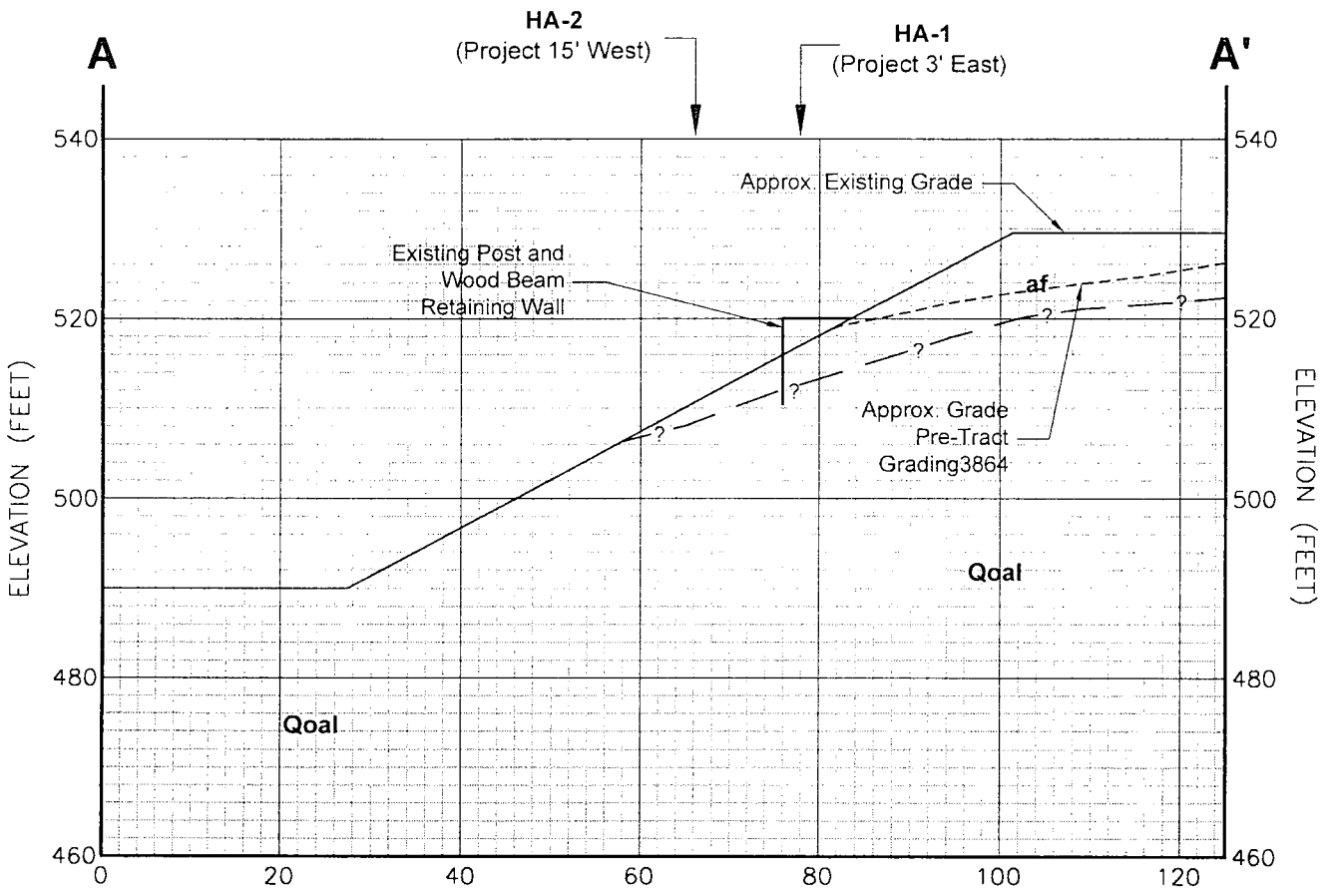
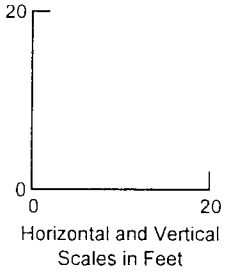


BASE MAP SOURCE: Datum elevation per Joel Silverman & Associates (1986).



LEGEND

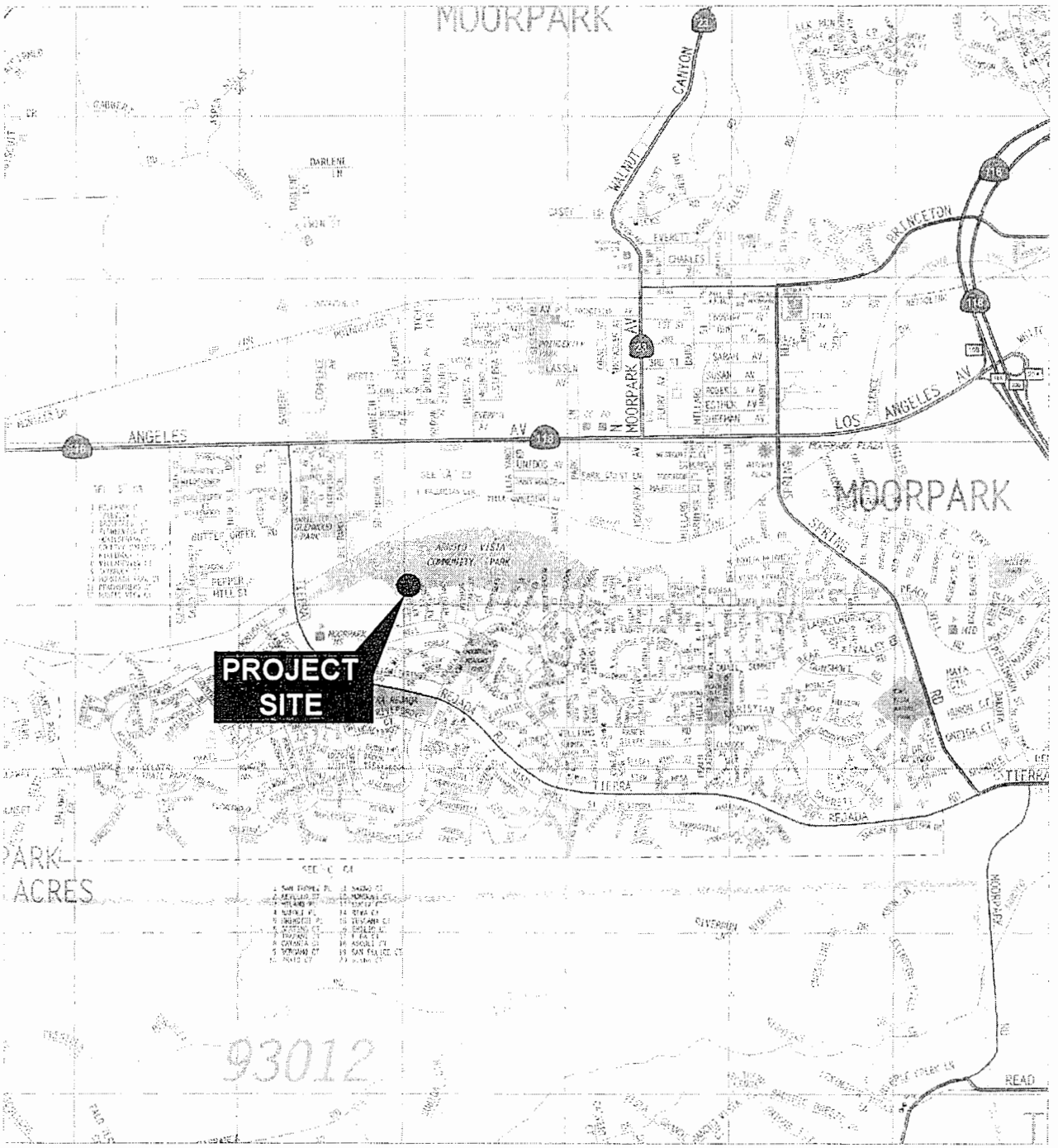
af	Artificial fill
Qoal	Older Alluvium
—?—	Estimated geologic contact

M:\Drafting\JOBFILES\2014\04.62140011\Drawings\A04.62140011-03 Cross Sect.dwg 04-07-2014 - 12:10pm

GEOLOGIC CROSS SECTION A-A'

Arroyo Vista Park
Replacement Retaining Wall Project
Moorpark, California

PLATE 3



BASE MAP SOURCE: Thomas Guide 2007, Ventura County (p. 476 & 496).

NORTH

0 24000

FEET

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VICINITY MAP
Arroyo Vista Park
Replacement Retaining Wall Project
Moorpark, California

PLATE 1

LOCATION: See Plate 2

SURFACE EL: ft +/- (rel. datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						ARTIFICIAL FILL (af) Sandy SILT (ML): medium stiff, dark brown, very moist, fine-grained sand							
	2												
			1			Lean CLAY with sand (CL): stiff, dark yellowish bbrown, dry to moist, secondary porosity to approximately 1/16-inch in diameter							
	4					- 1-foot seam of very moist sandy silt at approximately 4 feet							
			2				114	104	10				
	6					**OLDER ALLUVIUM (Qoal)** Sandy lean CLAY (CL): very stiff, yellowish brown, moist, fine-grained sand, pin sized secondary porosity, silty							
			3								36	20	
	8					- very pale brown, decreasing moisture at 7.5 feet							
	10		4			- lense of silty sand approximately 2 feet thick at 10 feet			5				
	12		5			- decreased sand content							
	14					Poorly graded SAND with silt (SP-SM): medium dense to dense, very pale brown, dry to moist, trace angular gravel to 3/4-inch in diameter							
			6				106	103	3				
	16					- reduced grain size and increased silt content at approximately 16 feet							
	18		7										
	20		8			Sandy lean CLAY (CL): very stiff, yellow, moist, secondary porosity, rootlets	102	93	9				
	22												
	24												
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: March 5, 2014

DRILLING METHOD: 4-inch-dia. Hand Auger
HAMMER TYPE: Hand-slide
DRILLED BY: Mike's Excavating Service
LOGGED BY: J Martos
CHECKED BY: G S Denlinger

LOG OF DRILL HOLE NO. HA-1

Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE A-2

LOCATION: See Plate 2

SURFACE EL: ft +/- (rel. datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						ARTIFICIAL FILL (af) SILT with sand (ML): medium stiff, dark brown, very moist							
	2												
			1			Lean CLAY with sand (CL): very stiff, brown, moist	110	102	7				
	4												
			2			**OLDER ALLUVIUM (Qoal)** Sandy lean CLAY (CL): very stiff, very pale brown, moist, fine-grained sand, secondary porosity							
	6												
			3			Interbedded Clayey SAND (SC) and Poorly graded SAND with silt (SP-SM): medium dense, very pale brown, dry to moist, fine, some medium sand	98	94	4				
	8												
	10		4										
	12					Sandy lean CLAY (CL): very stiff, very pale brown, dry to moist, with pale gray veins, some secondary porosity							
			5				105	95	10				
	14												
			6			- decreased sand content at 15'							
	16												
			7										
	18												
	20		8										
	22												
	24												
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: March 5, 2014

DRILLING METHOD: 4-inch-dia. Hand Auger
HAMMER TYPE: Hand-slide
DRILLED BY: Mike's Excavating Service
LOGGED BY: J Martos
CHECKED BY: G S Denlinger

LOG OF DRILL HOLE NO. HA-2

Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE A-3

LOCATION: See Plate 2

SURFACE EL: ft +/- (rel. datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						ARTIFICIAL FILL (af) Sandy SILT (ML): medium stiff, very dark brown, very moist, fine-grained sand							
	2		1			Sandy lean CLAY (CL): medium stiff, dark yellowish brown, moist, fine-grained sand, silty, socondary porosity up to approximately 1/16-inch in diameter							
	4		2				94	88	7				
	6					**OLDER ALLUVIUM (Qoal)** Clayey SAND (SC): medium dense, dark yellowish brown, moist, fine, pin sized secondary porosity							
	8		3										
	10		4			- seam of sandy lean clay, very pale brown, decreased moisture, trace coarse sand at approximately 10 feet	97	89	9				
	12		5			- increasing sand content, rootlets at approximately 12.5 feet							
	14					Poorly graded SAND with silt (SP-SM): medium dense, very pale brown, dry to moist, fine							
	16		6										
	18		7			Sandy lean CLAY (CL): very stiff, very pale brown, dry to moist, fin-grained sand, pin sized secondary porosity							
	20		8			- rootlets at approximately 20 feet							
	22												
	24												
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: March 5, 2014

DRILLING METHOD: 4-inch-dia. Hand Auger
HAMMER TYPE: Hand-slide
DRILLED BY: Mike's Excavating Service
LOGGED BY: J Martos
CHECKED BY: G S Denlinger

LOG OF DRILL HOLE NO. HA-3

Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE A-4

LOCATION: See Plate 2

SURFACE EL: ft +/- (rel. datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						ARTIFICIAL FILL (af) Sandy SILT (ML): medium stiff, very dark brown, very moist, fine-grained sand - large root at approximately 1 foot							
	2		1			Sandy lean CLAY (CL): stiff to very stiff, dark yellowish brown, moist, fine-grained sand, rootlet	59	51	16				
	4					**OLDER ALLUVIUM (Qoal)** Sandy lean CLAY (CL): very stiff, very pale brown, moist, secondary porosity to approximately 1/16-inch in diameter							
	6		2										
	8		3			- decreased sand, dry to moist, void size diameter decreasing		90	6				u 4.8
	10		4										
	12		5				103	96	8				
	14		6			Poorly graded SAND with silt (SP-SM): medium dense, pale brown, dry to moist, fine to medium							
	16												
	18		7			Clayey SAND (SC): medium dense, very pale brown, dry to moist, fine	109	102	7				
	20		8			- decreased sand content, increased clay content at approximately 20 feet							
	22												
	24												
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

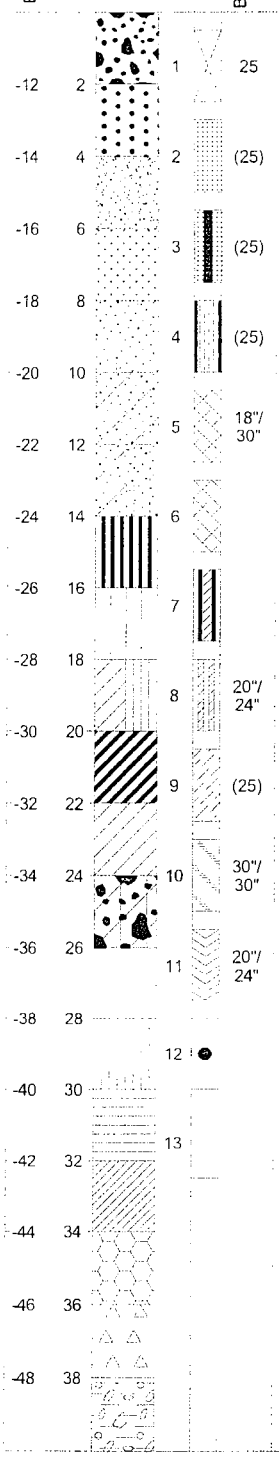
COMPLETION DEPTH: 20.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: March 5, 2014

DRILLING METHOD: 4-inch-dia. Hand Auger
HAMMER TYPE: Hand-slide
DRILLED BY: Mike's Excavating Service
LOGGED BY: J Martos
CHECKED BY: G S Denlinger

LOG OF DRILL HOLE NO. HA-4

Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE A-5



LOCATION: The drill hole location referencing local landmarks or coordinates

SURFACE EL: Using local, MSL, MLLW or other datum

MATERIAL DESCRIPTION

Well graded GRAVEL (GW)	COARSE GRAINED
Poorly graded GRAVEL (GP)	COARSE GRAINED
Well graded SAND (SW)	COARSE GRAINED
Poorly graded SAND (SP)	COARSE GRAINED
Silty SAND (SM)	COARSE GRAINED
Clayey SAND (SC)	COARSE GRAINED
Silty, Clayey SAND (SC-SM)	COARSE GRAINED
Elastic SILT (MH)	FINE GRAINED
SILT (ML)	FINE GRAINED
Silty CLAY (CL-ML)	FINE GRAINED
Fat CLAY (CH)	FINE GRAINED
Lean CLAY (CL)	FINE GRAINED
CONGLOMERATE	ROCK
SANDSTONE	ROCK
SILTSTONE	ROCK
MUDSTONE	ROCK
CLAYSTONE	ROCK
BASALT	ROCK
ANDESITE BRECCIA	ROCK
Paving and/or Base Materials	

General Notes

Soil Texture Symbol

Sloped line in symbol column indicates transitional boundary

Samplers and sampler dimensions
(unless otherwise noted in report text) are as follows:

Symbol for:

1	SPT Sampler, driven 1-3/8" ID, 2" OD
2	CA Liner Sampler, driven 2-3/8" ID, 3" OD
3	CA Liner Sampler, disturbed 2-3/8" ID, 3" OD
4	Thin-walled Tube, pushed 2-7/8" ID, 3" OD
5	Bulk Bag Sample (from cuttings)
6	CA Liner Sampler, Bagged
7	Hand Auger Sample
8	CME Core Sample
9	Pitcher Sample
10	Lexan Sample
11	Vibracore Sample
12	No Sample Recovered
13	Sonic Soil Core Sample

Sampler Driving Resistance

Number of blows with 140 lb. hammer, falling 30" to drive sampler 1 ft. after seating sampler 6"; for example,

Blows/ft	Description
25	25 blows drove sampler 12" after initial 6" of seating
86/11"	After driving sampler the initial 6" of seating, 36 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
50/6"	50 blows drove sampler 6" after initial 6" of seating
Ref/3"	50 blows drove sampler 3" during initial 6" seating interval

Blow counts for California Liner Sampler shown in ( )

Length of sample symbol approximates recovery length

Classification of Soils per ASTM D2487 or D2488

Geologic Formation noted in bold font at the top of interpreted interval

Strength Legend

Q = Unconfined Compression
u = Unconsolidated Undrained Triaxial
t = Torvane
p = Pocket Penetrometer
m = Miniature Vane

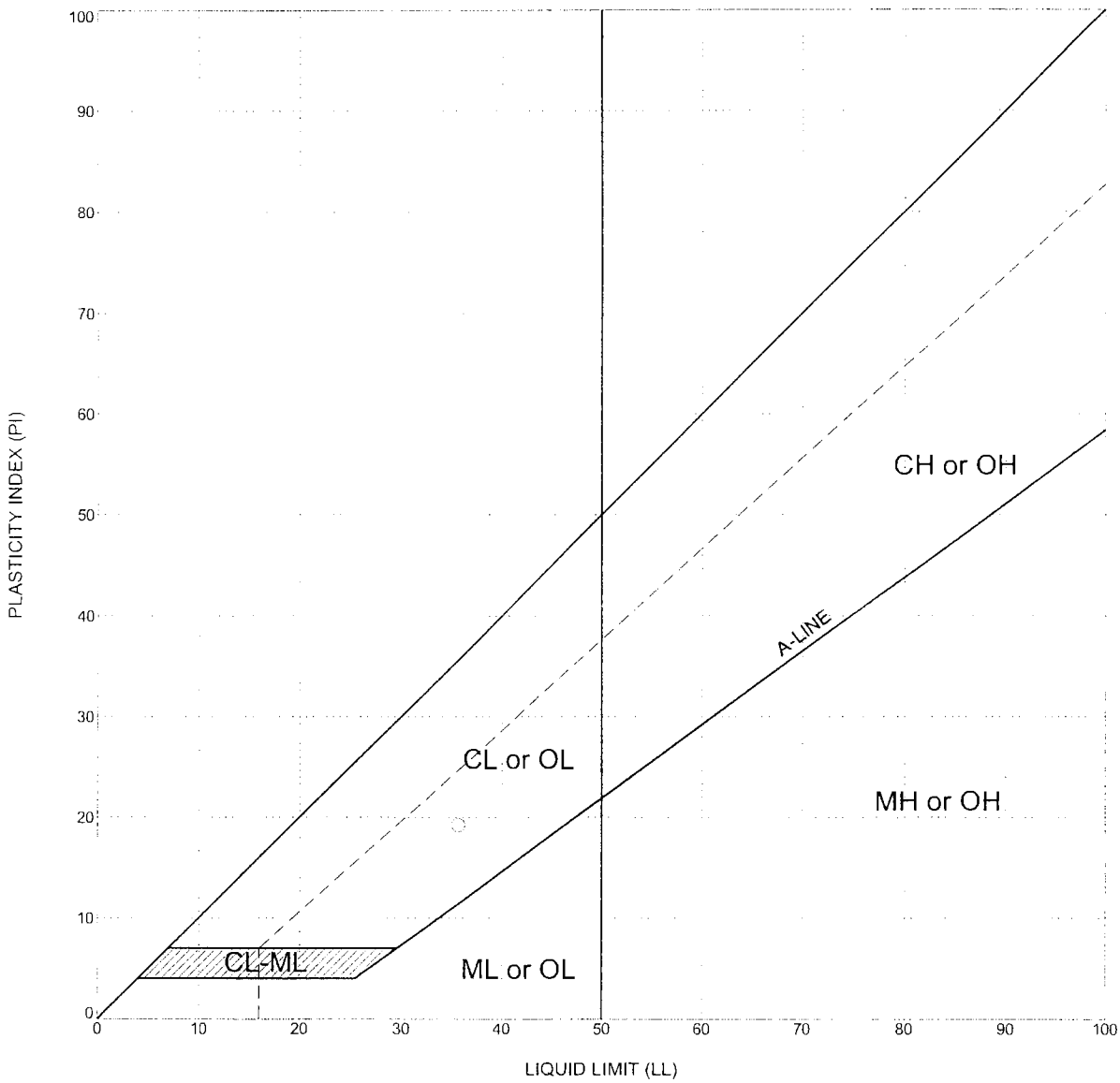
Water Level Symbols

Initial or perched water level
▼ Final ground water level
Seepages encountered

Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

KEY TO TERMS & SYMBOLS USED ON LOGS

PLATE A-1



LEGEND		CLASSIFICATION	ATTERBERG LIMITS TEST RESULTS		
location	depth, ft		LIQUID LIMIT(LL)	PLASTIC LIMIT(PL)	PLASTICITY INDEX (PI)
HA-1	7.5	Sandy lean CLAY (CL)	36	16	20

PLASTICITY CHART
Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE B-2

City of Moorpark
Project No. 04.62140011

DRILL HOLE	DEPTH, ft	SAMPLE NUMBER	MATERIAL DESCRIPTION	UWW pcf	UDW pcf	MC %	FINES %	ATTERBERG LIMITS		COMPACTION TEST		DIRECT SHEAR		COMPRESSIVE STRENGTH TESTS		CORROSIVITY TESTS				R-VALUE	EXPANSION INDEX	SAND EQUIVALENT (SE)	Specific Gravity
								LL	PI	MAX DD pcf	OPT MC %	C ksf	PHI deg	Qu, ksf	S_u (Cell Prs.) ksf	R	pH	Cl	So_4 (%)				
HA-1	5.0	2	Lean CLAY with sand (CL)	114	104	10																	
HA-1	7.5	3	Sandy lean CLAY (CL)					36	20			0.1	34										
HA-1	10.0	4	Silty SAND (SM)			5																	
HA-1	15.0	6	Poorly graded SAND with silt (SP-SM)	106	103	3																	
HA-1	20.0	8	Sandy lean CLAY (CL)	102	93	9																	
HA-2	2.5	1	Lean CLAY with sand (CL)	110	102	7																	
HA-2	7.5	3	Poorly graded SAND with silt (SP-SM)	98	94	4																	
HA-2	12.5	5	Sandy Lean CLAY (CL)	105	95	10																	
HA-2	15.0	6	Lean CLAY with sand (CL)									0.3	33										
HA-3	5.0	2	Sandy Lean CLAY (CL)	94	88	7																	
HA-3	10.0	4	Sandy Lean CLAY (CL)	97	89	9																	
HA-3	15.0	6	Poorly graded SAND with silt (SP-SM)									0.5	32										
HA-4	2.5	1	Sandy Lean CLAY (CL)	59	51	16																	
HA-4	7.5	3	Sandy Lean CLAY (CL)		90	6									4.8(0.9)								
HA-4	12.5	5	Sandy Lean CLAY (CL)	103	96	8																	
HA-4	17.5	7	Clayey SAND (SC)	109	102	7																	

SUMMARY OF LABORATORY TEST RESULTS
Arroyo Vista Park Retaining Replacement Project
Moorpark, California

PLATE B-1

Phoenix Civil Engineering, Inc.

4532 Telephone Road, Ste. 113 Ventura, Ca 93003 805.658.6800
info@phoenixcivil.com www.phoenixcivil.com

Mr. Jeremy Laurentowski
City of Moorpark
799 Moorpark Ave.
Moorpark, CA 93021

July 22, 2014

City of Moorpark – Arroyo Vista Park Retaining Wall Design– Proposal for Engineering Services

Dear Mr. Laurentowski-

I am pleased to provide you with this proposal for engineering services associated with the Arroyo Vista Park Retaining Wall Design project. The City has an existing wooden and metal post retaining wall on the southern end of the park near the tennis courts. The wall was installed many years ago and it abuts a private homeowner's association. There is an approximate 4 foot offset from the park property line and the private fence located behind two parcels. The existing retaining wall is approximately 200 feet long. The City retained Fugro Consultants, Inc., to evaluate the retaining wall and the underlying slope stability as the wall is showing signs of failure. The geotechnical report recommended a soldier pile and tieback retaining wall structure for the entire length of the existing retaining structure. In reviewing the report, the recommended solution appears to be very conservative and it is recommended that the design team revisit the analysis with Fugro to ensure that the proposed solution is cost effective for the city and provides a long term solution to any potential geotechnical issues. In our discussion, you mentioned that the desire is to construct the replacement retaining wall directly on the parcel line (or very close) to incorporate the private fence into the top of the structure. This will assist in lessening some undesirable behavior that is occurring in the area between the private fence and the retaining wall structure. The existing slope will be regarded to meet the new retaining wall structure. Based on our conversations and my review of the documents you provided, I have prepared my proposal to include the following:

Task 101:	Topographic Survey
Task 102:	Coordination with Geotechnical Engineer
Task 103:	Preliminary Retaining Wall Design
Task 104:	50% Plans, Specifications and Opinion of Probable Construction Cost Preparation
Task 105:	90% Plans, Specifications and OPCC Preparation
Task 106:	Final Plans, Specifications and OPCC Deliverable
Task 107:	Reimbursables

I appreciate the opportunity to submit this proposal to assist you with this project. I have attached a scope of work and our professional services rate sheet along with a fee schedule detailed by task. Our scope of work covers design services only and does not include permit or design assistance during construction services. We can provide these services if requested.

Please let me know if you have any questions or would like to discuss my proposal.

Sincerely,

Jon Turner, PE
Principal Engineer

Scope of Services

Background/Project Understanding

Arroyo Vista Park is located in the City of Moorpark. The City has an existing wooden and metal post retaining wall on the southern end of the park near the tennis courts. The wall was installed many years ago and it abuts a private homeowner's association. There is an approximate 4 foot offset from the park property line and the private fence located behind two parcels. The existing retaining wall is approximately 200 feet long. The City retained Fugro Consultants, Inc., to evaluate the retaining wall and the underlying slope stability as the wall is showing signs of failure. The geotechnical report recommended a soldier pile and tieback retaining wall structure for the entire length of the existing retaining structure. In reviewing the report, the recommended solution appears to be very conservative and it is recommended that the design team revisit the analysis with Fugro to ensure that the proposed solution is cost effective for the city and provides a long term solution to any potential geotechnical issues. In our discussion, you mentioned that the desire is to construct the replacement retaining wall directly on the parcel line (or very close) to incorporate the private fence into the top of the structure. This will assist in lessening some undesirable behavior that is occurring in the area between the private fence and the retaining wall structure. The existing slope will be regarded to meet the new retaining wall structure. Based on our conversations and my review of the documents you provided, I have prepared my proposal to include the following:

Task 101: Topographic Survey

Benner and Carpenter, as a subconsultant to Phoenix Civil Engineering, will perform topographic ground survey of the site. The City has provided aerial topographic surveying, but in the area of the proposed retaining wall and the downslope areas there is existing brush and trees which will create anomalies in the aerial survey. A retaining wall design is going to require fairly accurate elevation information for design and construction.

The following efforts are included in this task:

- Review of the existing City provided aerial topographic survey information.
- Ground topographic surveying of the site around the proposed retaining wall. This will require some property owner coordination.

Deliverable: No deliverable is associated with this task. Information gathered in this task will be used in Tasks 102 through 106.

Task 102: Coordination with Geotechnical Engineer

The City retained Fugro Consultants, Inc., to analyze the slope and develop a recommendation for the retaining wall. As the recommendation is well thought out, it is believed to be very conservative for the installation/purpose so this task will involve a meeting and discussion with the geotechnical engineer to review other potential options for a recommended retaining wall at the park.

The following efforts are included in this task:

- Review of the geotechnical recommendations with Fugro Consultants, Inc.

Deliverable: The meeting discussions will be summarized for review by the City. The summary will be provided in electronic format (.pdf) to the City Project Manager.

Task 103: Preliminary Retaining Wall Design

Once Task 102 is complete, it is envisioned that two or more options for replacement retaining wall configurations/designs will be acceptable solutions for the park. Sketches of these options will be prepared along with benefits/issues so that the City Project Manager can make a decision as to which design to pursue.

The following efforts are included in this task:

- Preparation of the concept sketches for retaining wall systems for presentation to the City Project Manager.
- Meeting with the City staff to discuss their comments and develop a system to design.

Deliverable: Three (3) sets of the sketches and summary will be provided to the City for their internal review. One electronic copy of the sketch package (.pdf) will be provided.

Task 104: 50% Plans, Specifications and Estimate Preparation

After completion of Task 103, the selected retaining wall configuration will be designed for the site. This will include incorporation of the wrought iron fencing that borders the homeowners association (two affected parcels). Plan sheets reflecting the proposed design and associated notes/information will be prepared. The calculations for the wall will be provided to the city. Accompanying the plan set, a set of technical specifications for the improvements will be prepared. These specifications will be based on the Standard Specifications for Public Works Construction (SSPWC). For coordination purposes, an electronic copy of the city's standard front end documents will be provided to the design team. Lastly, an engineer's opinion of probable construction cost (OPCC) will be prepared for the proposed improvements. It is envisioned that the plan set will be made up of the following sheets:

- Title Sheet
- Notes, Abbreviations, Survey
- Site Plan and Profile
- Wall Sections and Details

The following efforts are included in this task:

- Development of project improvement design plans.
- Compilation of the structural calculations for the retaining wall.
- Preparation of technical specifications and OPCC for the improvements.

Deliverable: Three (3) sets of the 50% plans (22 x 34 size), technical specifications outline and OPCC will be provided to the City for their review. One electronic copy of the project deliverables package (.pdf) will be provided.

Task 105: 90% Plans, Specifications and Estimate Preparation

Once the City review comments have been received, the project plans, specifications and OPCC will be updated, incorporating the review comments and continuing to refine the design package.

The following efforts are included in this task:

- Incorporation of City review comments on the 50% deliverable package into the Contract Documents.
- Preparation of 90% plans, specifications and OPCC.

Deliverable: Three (3) sets of the 90% plans (22 x 34 size), technical specifications outline and OPCC will be provided to the City for their review. One electronic copy of the project deliverables package (.pdf) will be provided.

Task 106: Final Plans, Specifications and Estimate Deliverable
Once the City review comments have been received relating to the 90% deliverable package, the project plans, specifications and OPCC will be finalized, incorporating the review comments.

The following efforts are included in this task:

- Incorporation of City review comments on the 90% deliverable package into the Contract Documents.
- Finalization of the plans, specifications and OPCC.
- Delivery of the project AutoCAD files of the plans and the underlying survey information.

Deliverable: Three (3) sets of the final plans (22 x 34 size on paper), technical specifications outline and OPCC will be provided to the City for their review. One mylar copy of the full size plans will be provided. One electronic copy of the project deliverables package (.pdf) will be provided.

Task 107: Reimbursables
This task covers the anticipated cost of the project deliverables (large format printing, mylar printing, multiple specification printing).

The following efforts are included in this task:

- Preparation of the full size sheet (22 x 34) printing for the deliverable packages to the City.
- Printing of the mylar plan sheets associated with Task 106.

Deliverable: As needed by the City.

Schedule

The work associated with Tasks 101 through 107 will be made a top priority. Every effort will be made to keep the project schedule moving along. Review times are difficult to estimate, but it is envisioned that the project Contract Documents can be prepared within 10 weeks of the project Notice to Proceed (assuming one week review times).

Fees
Work associated with Tasks 101 through 107 is estimated to cost $19,191. A breakdown of the level of effort is listed below:

Task 101:	Topographic Survey	$6,114
Task 102:	Coordination with Geotechnical Engineer	$465
Task 103:	Preliminary Retaining Wall Design	$1,270
Task 104:	50% Plans, Specifications and OPCC Preparation	$4,704
Task 105:	90% Plans, Specifications and OPCC Preparation	$3,172
Task 106:	Final Plans, Specifications and OPCC Deliverable	$2,266
Task 107:	Reimbursables	$1,200

PHOENIX
CIVIL ENGINEERING, INC

Professional Services Rate Sheet

Principal Engineer	$155/hour
Resident Engineer	$145/hour
Professional Engineer	$130/hour
Staff Engineer	$120/hour
Senior Designer	$116/hour
Construction Observer	$100/hour
Junior Designer	$85/hour
Technical Assistant	$65/hour
Administrative Assistant	$45/hour

Costs associated with printing and computer time are calculated in the rates. Large quantities of printing (multiple sets of specifications, reports, etc.) will be billed at an agreed upon rate. Subconsultant costs will be marked up 10%.

FUGRO CONSULTANTS, INC.

4820 McGrath Street, Suite
Ventura, California 93003-
Tel: (805) 650-7000
Fax: (805) 650-7010

September 9, 2014
Project No. 04.62140011

City of Moorpark
Public Works Department
799 Moorpark Avenue
Moorpark, California 93021

Attention: Mr. Jeremy Laurentowski

Subject: Proposal for Supplemental Engineering and Consulting Services, Proposed Replacement Retaining Wall Arroyo Vista Park, Moorpark, California

Reference: Fugro (2014), "Geotechnical Engineering Letter-Report, Proposed Replacement Retaining Wall Arroyo Vista Park, Moorpark, California," report prepared for the City of Moorpark dated April 9

Dear Mr. Laurentowski:

We understand that the City is evaluating various types of walls designed to replace a distressed older steel post and wood beam retaining wall and is located along the south property line of the park and adjacent to a residential housing tract. The City is working with their design consultant (Phoenix Civil Engineering) to develop a preferred wall type and related PSE's for the work and has requested Fugro provide additional geotechnical input and consultation during this effort.

We anticipate our work will involve the following tasks:

Task 1 - Meeting and Consultation. We will meet with City staff and their design consultant on an ad-requested basis and provide input and opinions regarding subsurface conditions and geotechnical engineering design issues. For budgeting purposed, we have assumed that 12 hours of principal staff time (including travel time) will be required and that meetings will be by telephone, at the City of Moorpark, or Phoenix Civil Engineering's office in Ventura.

Task 2 - Additional Geotechnical Engineering Evaluation and Reporting. We will perform additional geotechnical engineering evaluations, on an as-needed basis, to aid in the type selection process and PSE work. We will summarize the findings of our additional evaluations in an addendum letter to our referenced geotechnical engineering report. Unless otherwise directed, we will submit three (3) hardbound copies of the addendum letter and an electronic copy in Portable Document Format (.pdf).

ESTIMATED FEE AND SCHEDULE

We will provide the proposed services on a time-and-expense basis in accordance with Fee Schedule rates in effect at the time of work. A breakdown of the estimated fee for the proposed additional services is provided below in Table 1. Our fee to complete the scope of services described above is estimated at $5,000.

Table 1. Fee Estimate

Description	Estimated Fugro Costs	Estimated Direct Costs	Estimated Fee
Task 1, Meetings and Consultation.	$2,500	--	$2,500
Task 2, Additional Evaluation and Reporting.	$2,500	--	$2,500
Estimated Total:	$5,000	--	$5,000

The times and fees are based on estimates of the staff hours required to complete the work scope. We will not exceed the estimated fee without prior written approval from the City. We can provide additional services as well as construction observation and materials testing services according to fee schedule rates. This proposal can be considered valid for a period of 60 days, after which time Fugro reserves the right to revise the proposal prior to receiving authorization for our services.

We are prepared to initiate the proposed services within 1 week after receiving written authorization to proceed and work will be performed on an as-requested basis. The addendum letter can be provided to the project team within about 2 weeks of authorization to complete that task.

CLOSURE

We appreciate the opportunity to submit a proposal for this project and to continue our professional relationship with the City of Moorpark. If you wish to discuss our proposal, please contact the undersigned.

Sincerely,

FUGRO CONSULTANTS, INC.

Gregory S. Denlinger, GE
Principal Engineer

Attachments: Fugro 2014 Fee Schedule

Copies: 1 pdf copy (addressee) via email